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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/996,788	11/30/2001	Naokatsu Ikegami	OKI.286	4551

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EXAMINER

CHEN, KIN CHAN

ART UNIT PAPER NUMBER

1765

DATE MAILED: 04/07/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/996,788

Applicant(s)

IKEGAMI, NAOKATSU

Examiner

Kin-Chan Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 1-5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "said insulating film" in line 5. There is insufficient antecedent basis for this limitation in the claim.

In claim 5, line 1, "according to Claim 5" is vague and indefinite. Claim cannot be dependent of itself.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tahara et al. (US 5,356,515; hereinafter "Tahara") in view of Yamada (US 5,827,778).

Tahara teaches a method for manufacturing a semiconductor device having conductive path extending from an upper surface of an insulating layer of silicon dioxide on a semiconductor substrate to a conductive member embedded in the insulating

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layer. An etching mask may be formed on the insulating layer to define an etched hole for the conductive path within a permissible placement error. A selective etching process may be performed to the insulating layer to remove a region of the insulating layer not covered by the etching mask by using a reactive ion etching unit for introducing into a reaction chamber reactive gas of CHF_3 / CO components (col. 12, lines 52-65; col. 17, lines 1-27).

Tahara teaches the effect of etching selectivity of CO addition to CHF_3 with various flow ratios (col. 16, lines 52-67). Tahara also shows various process conditions and states that the etching method can be performed under various conditions in addition to the conditions employed in the embodiments (col. 17, 13-30). Tahara does not disclose that a flow ratio about 15/85. In a method of silicon oxide etching, Yamada teaches the effect of etching rate as function of flow ratio of CHF_3 / CO including a flow ratio about 15/85 (see Fig. 6). Hence, it would have been obvious to one with ordinary skill in the art to use a suitable flow rate of CHF_3 / CO as disclosed by Yamada in order to have a desired etching rate.

Tahara teaches selective etching process for forming a contact hole for the conductive path. Instant claims differ from Tahara by specifying filling the hole with a conductive material for the conductive path. However, it is a conventional process step for manufacturing a semiconductor device, and Yamada teaches same (col. 1, lines 31). Hence, it would have been obvious to one with ordinary skill in the art to fill the hole formed by the etching process with a conductive material in order to complete the interconnect structure in semiconductor device fabrication.

Claim 6 differs from the prior art by specifying depositing a polymeric product by a polymeric film generating action of the reactive gas into an etched groove resulting from the misalignment of the etching mask. However, since the etching mask and the desired location of the hole are never perfectly lined up with each other, it appears that an etched groove is always exist in the etching process (see Figs. 1B, 1C of Yamada). It is well known that the etching process of using carbon-containing etchant gas produces polymeric byproducts, which deposit on the sidewalls and the bottom, see Pu et al. (US 5,843,847) in the record as evidence. Therefore, it would have been obvious to one with ordinary skill in the art that the combined prior art of Tahara and Yamada teaches same.

Tahara and Yamada do not specify the placement errors of etching mask required in their process and product. Dependent claims 2 and 4 differ from prior art by specifying various placement errors of etching mask. However, it is merely depending on the specific product requirement. Hence, it would have been obvious to one with ordinary skill in the art to determine it based on the need of the specific product design and requirement.

The above cited claims differ from the prior art by specifying various processing parameters (such as 1600 W of frequency power in claim 2; the flow rate is about (or not less than about) 300 sccm in claims 4 and 8. However, Tahara shows various process conditions and states that the etching method can be performed under various conditions in addition to the conditions employed in the embodiments (col. 17, 13-30). The power of the etching system and the flow rate of the etchant gas are commonly determined by routine experiment. The process of conducting routine optimizations so

as to produce an expected result is obvious to one of ordinary skill in the art. Hence, a person having ordinary skill in the art would have found it obvious to modify Tahara and Yamada by performing routine experiments (different processing parameters) in order to obtain optimal result.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Pu et al. (US 5,843,847; col. 1, line 64 through col. 2, line 2) Teaches that the etching process of using carbon-containing etchant gas produces polymeric byproducts, which deposit on the sidewalls and the bottom.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (703) 305-0222. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-2934.

April 3, 2003

K. C. Chen
Patent Examiner
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